LETTERS TO THE EDITOR.

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Vibrissæ on the Forepaws of Mammals.

IT is well enough known that carnivorous and other—especially nocturnal—animals are provided with numerous long hairs, generally called vibrissæ, upon various regions of the face. The "whiskers" of the cat are a familiar example. But it is not so widely known that there exists very commonly in those same creatures a tuft of long hairs upon the wrist, which are connected with a large nerve. There have been incidental references to these structures; thus Mr. Bland Sutton described and figured them in several Lemurs. But it is not, I believe, a matter of common knowledge that they are present in a great variety of mammals. I have examined members of the groups, Lemuroidea, Carnivora, Rodents, and Marsupials, and invariably found these structures in those members of the groups in question which use their forepaws as climbing or grasping organs, or in both ways. They are generally not very conspicuous, as the individual hairs are often not markedly thicker than those of the surrounding fur. But often they contrast by their colour. In a pale, almost albino, example of the squirrel *Sciurus maximus*, the hairs were especially obvious, owing to their being black, and thus contrasting with the pale brown of the surrounding part of the pelage. In a black cat the same vibrissæ were white. It is always, however, easy to assure oneself of their presence by the sense of touch. The bundle of these rather stiff hairs and the thick nerve termination cannot be missed, if the skin be gently squeezed. In a newly born phalanger this structure was particularly obvious; but in a kangaroo of corresponding age there were no signs of an elevation of the skin bearing thick hairs. It will be remembered that the mode of life of these two marsupials is very different. Although I have examined up to the present but few genera of mammals, it appears to me that this structure will be found to be pretty universal. I have of course not detected these arm vibrissæ in Ungulates.

Zoological Society's Gardens. FRANK E. BEDDARD.

The Distance to which the Firing of Heavy Guns is Heard.

IN the number of NATURE for August 16, there is an article by Mr. Charles Davison on the distance to which the firing of heavy guns is heard. The writer of the article seems to wish to collect facts bearing upon this question. I can supply one bit of information of the kind desired.

In the summer of 1863, during the siege of Charleston, S.C., by the Federal forces, being at the time an officer in the Confederate Army, I went, under orders, from Macon, Ga., to Charleston by way of Millen, Augusta and Branchville. It was just at the time of the first heavy naval bombardment of Port Sumtra. The train stopping at a water tank a few miles (I do not now remember just how many) on the Macon side of Millen, and therefore somewhat farther than this place from Charleston, I heard distinctly, not only the general, more or less varying, roar of the bombardment, but also the low boom of individual guns. The sound was faint, but unmistakable in the stillness while the engine was taking water, but was lost as soon as the train got into motion again and its noise began. At Augusta, during the stop made there, I could catch the sound of the guns again, though it was interfered with a good deal by the confused noise of a large town. At Branchville, a hamlet of a few houses, the sound was easily recognised by any one, and was accompanied by a general *feeling* of tremor.

Millen is nearly due west from Charleston, and distant about 117 miles in a direct line. Augusta is approximately 25° north of west from Charleston, and about 122 miles distant. Branchville is about 35° north of west from Charleston, and at a distance of about sixty miles.

Mr. Davison says that he has but little information as to the distance at which the discharge of *single guns* has been heard. I may therefore add that the heaviest guns in use in the bombardment I refer to were the 15-inch smooth bore muzzle-loading guns carried by the Federal turreted "Monitors." I do not remember now what was reported to be the charge of powder used, but they were, of course, firing shotted cartridges—some solid shot, but more frequently shell. J. W. MALLET.

The Solidification of Alloys.

IN a recent discussion on alloys, which took place at the Bradford Meeting of the British Association in the Section of Chemistry, a curious uncertainty was alluded to, which occurs in the cooling of certain alloys from the liquid state, as to the relative proportions of different varieties of crystals which form, depending on the rate that the cooling is proceeding with.

I would wish to draw the attention of those more particularly interested in the matter to a direction in which to look for what may be one of the causes of this peculiarity, namely, to the effect that different conductivities for heat in the different kinds of crystals may exercise in determining the relative proportions in which they form, where, as in this case, two or more varieties are possible. Where there is a difference in the conductivity of two possible varieties, the more of the better conducting material that is formed the faster in general the cooling can proceed.

The matter might be looked upon as a kind of inorganic evolution. Suppose that in the first instance round the boundaries, through which heat is passing out, of the cooling material, the two varieties form with equal facility, where the better conducting material forms heat escapes fastest and solidification of the molten material proceeds fastest, we may suppose this to follow in composition the lines of the crystals in proximity, namely, of the better conducting kind. Thus, by a kind of survival of the fittest, one of the varieties prevails.

When the cooling is very slow, where in the limit the temperature is at any moment the same throughout, this controlling influence is a vanishing quantity.

A similar principle is probably the cause of the radiating structure seen often in a cooled mass of certain materials, such as bismuth and possibly ice, which have different conductivities in different directions in the crystal. FRED. T. TROUTON.

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The Reform of Mathematical Teaching.

AS I am in full sympathy with Prof. Perry's views, my own training, somewhat on the lines suggested by him, may be of interest. I was once taught Euclid and thoroughly hated the subject. At thirteen I was sent to school in Germany, where I was taught geometry; it had so little resemblance to Euclid that I looked on it as a new subject and was delighted with it. After eighteen months I returned to England to serve my apprenticeship, but not before I had advanced as far as solid geometry, quadratic equations and trigonometry, and I believe that this early and rapid mathematical training was of inestimable advantage to me in the works. It seems unconsciously to have led me to look on practical subjects with so much of a mathematical feeling that even now my fellow engineers consider me very mathematical, yet all the subsequent mathematical training at college (Germany) only extended over another eighteen months, and I admit that I would have liked to have had more.

I now come in contact with many engineers, both old and young, and almost invariably find that they are unmathematical, *i.e.*, they cannot look at an engineering problem with an analytical eye; and no wonder, if they have been brought up on Euclid. To me these volumes seem to be a collection of mathematical puzzles, which the ancient Greeks sent each other for solution, and which are most excellently edited by Euclid. A similar collection might nowadays be made of the trying problems in the chess columns of our daily literature, and these might be so pieced together as to afford most excellent mental training, but such a work would never teach good chess playing. It would be an excellent reference book for past masters, and that is what Euclid would still be if higher mathematics had not been invented. C. E. STROMEYER.

Lancefield, West Didsbury.

Leaf Decay and Autumn Tints.

"OBSERVATION shows," says Emile Mer, "that in most cases where wood dies in contact with living wood there is produced from the second towards the first a migration of starch and tannin, and (in a conifer) of resin; there is thus produced from the portions remaining living towards the dying or dead portions a drainage of substances, &c." These remarks refer to the formation of secondary periderm and of the duramen, but their scope and tenour may perhaps, I think, be extended to the case of forest leaves approaching the end of their existence as living